

The first interstellar comet 2I/Borisov: a new touch in the NEO problem



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ALIEN COMET VISITING OUR SOLAR SYSTEM IS LIKE NOTHING EVER SEEN BEFORE BUT LOOKS STRANGELY FAMILIAR, SCIENTISTS CONFIRM

"We really hoped to receive this message one day. We only didn't know when."

Andrew Griffin | @_andrew_griffin | Monday 14 October 2019 15:33 | 13 comments

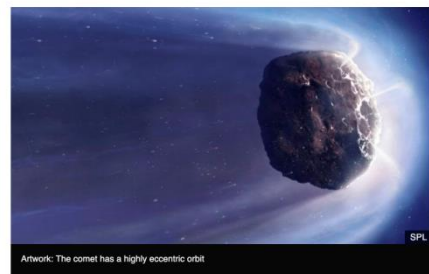
An interstellar comet visiting our solar system is like nothing ever seen before, scientists have confirmed – but looks strangely familiar. The object, known as 2I/Borisov, has been examined by researchers who say that it has the potential to transform our understanding of the universe that surrounds us.

Scientists have long thought that the gaps between the stars could be home to various comets and asteroids that have been thrown out of their home planetary systems. As they make their way through the universe, they would pass through our solar system and give us the opportunity to spot them, astronomers speculated.

The first of those objects was seen two years ago, when scientists saw 'Oumuamua, and confirmed that such interstellar objects exist. Since then, they have been watching in hope of seeing another interstellar visitor.

Astronomers now know that 2I/Borisov is the second such alien visitor ever seen – and the first of its kind, a comet sailing through our solar system from another place entirely.

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 Science & Environment
Has another interstellar visitor been found?
 By Paul Rincon
 Science editor, BBC News website
 12 September 2019



An amateur astronomer has discovered a comet that could come from outside our Solar System. If so, it would be the second interstellar object after the elongated body known as 'Oumuamua was identified in 2017. The Minor Planet Center (MPC) at Harvard University has issued a formal announcement of the discovery.

НАУКА
 TACC
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Первая межзвездная комета оказалась еще меньше
 Об этом рассказали самые детальные снимки, которые сделал телескоп "Хаббл"



TACC, 13 декабря. Орбитальная обсерватория снимки кометы Борисова, второго межзвездного посетителя нашей Солнечной системы, в последние мгновения перед самым ее прохождением через главный пояс астероидов оказались еще меньше, чем на то указывали данные команд "Хаббла".
 "Удивительно, но эти снимки показывают, что комета еще меньше, чем на то указывали предыдущие наблюдения. Это важно потому что..."

NASA
 Dec. 12, 2019
Interstellar Comet 2I/Borisov Swings Past Sun

When astronomers see something in the universe that at first glance seems like one-of-a-kind, it's bound to stir up a lot of excitement. Interstellar comet 2I/Borisov. This mysterious visitor from the depths of space is the first identified comet to arrive here from another star. We know when the comet started heading toward our Sun, but it won't hang around for long. The Sun's gravity is slightly deflecting its trajectory because of the shape of its orbit and high velocity of about 100,000 miles per hour. Telescopes around the world have been watching the fleeting visitor. NASA's Hubble Space Telescope has provided the sharpest images of the comet yet. Since October the space telescope has been following the comet like a sports photographer following horses speeding across a football field. Though comet Borisov is the first of its kind, no doubt there are many other comet vagabonds out there, plying the vastness of space. Astronomers will eagerly be on the lookout for the next mysterious visitor from far beyond.



Comet 2I/Borisov is only the second interstellar object known to have passed through the solar system. These two images, taken by NASA's Hubble Space Telescope, show the comet near a background galaxy (left) and soon after its closest approach to the Sun (right). Credits: NASA, ESA and D. Jewitt (UCLA)

ESA
COMET 2I/BORISOV AND DISTANT GALAXY IN NOVEMBER 2019

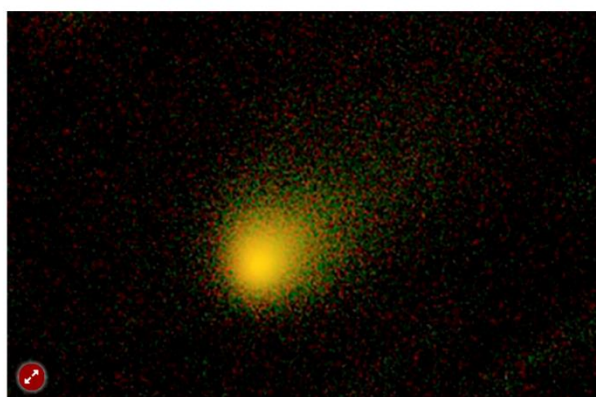


Date: 12 December 2019
 Satellite: Hubble Space Telescope
 Subjects: Comet 2I/Borisov
 Copyright: NASA, ESA, and D. Jewitt (UCLA), CC BY 4.0
 Comet 2I/Borisov is only the second interstellar object known to have passed through our Solar System. In this image taken by the NASA/ESA Hubble Space Telescope, the comet appears in front of a distant background spiral galaxy. The galaxy's bright central core is smeared in the image because Hubble was tracking the comet. Borisov was approximately 326 million kilometres from Earth in this exposure. Its tail of ejected dust streaks off to the upper right.

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Nachrichten > Wissenschaft > Weltall > Kometen > Komet 2I/Borisov: Interstellarer Besucher ist verblüffend normal
Komet 2I/Borisov
Interstellarer Besucher ist verblüffend normal
 Der Komet Komet 2I/Borisov ist außergewöhnlich - er kommt aus der Tiefe des Alls. Andererseits unterscheidet sich nicht von Kometen zu unterscheiden, die es in unserem Sonnensystem gibt. Das zeigt die Analysen.



Diese Aufnahme des Kometen 2I/Borisov ist aus Bildern in zwei Farbbereichen zusammengesetzt

SCIENTIFIC AMERICAN 175 YEARS
 nature PUBLICATIONS SPACE
Second Ever Interstellar Comet Contains Alien Water
 Scientists have spotted signs of water as the object 2I/Borisov streaks toward the sun
 By Alexandra Witze, Nature magazine on October 30, 2019

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 A Hubble Space Telescope image of comet 2I/Borisov, the second confirmed interstellar object to enter our solar system. Credit: NASA, ESA and J. DePasquale (STScI)
 Astronomers have spotted signs of water spraying off comet 2I/Borisov, which is flying towards the Sun on a journey from interstellar space. It is

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Interstellar comet just like ones from our solar system – astronomers
 Scientists tracking 2I/Borisov say some formation processes may be common between stars

A handout photo made available by the Gemini Observatory shows the interstellar comet 2I/Borisov. Photograph: Gemini Observatory/NSF/AURA/EPA
 The first interstellar comet to be tracked by astronomers as it hurtles through our solar system is unremarkable in every way apart from where it comes from, researchers have said.
 Scientists reached the conclusion after observing 2I/Borisov with two of the most powerful telescopes on Earth. They decided that it looked like any other comet except that it came from beyond the solar system and would soon leave for good.
 The unusual body was spotted in August by a Crimean amateur astronomer.



MARGO (L51)

Mobile Astronomical Robotics
Genon Observatory



Telescopes of the MARGO Observatory



2 x 0,3 m, F/1.5
GenonMax telescope
equipped with
4096 x 4096, 9 x 9 μm CCD

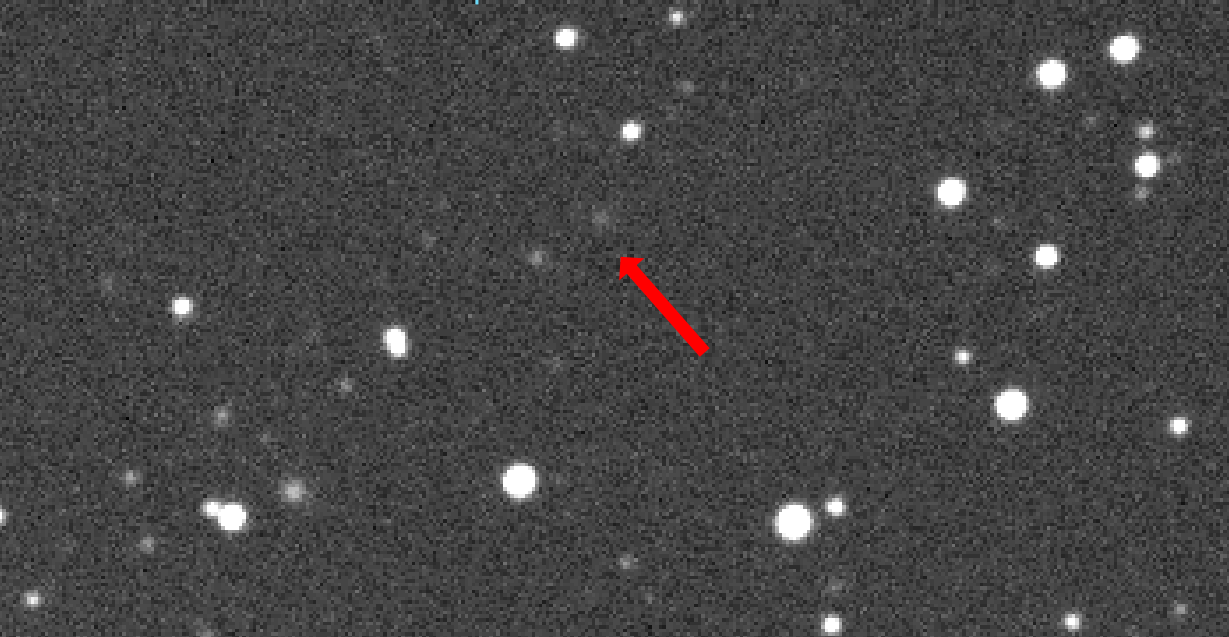


0,65 m, F/1.5
Hamilton telescope
equipped with
4096 x 4096, 9 x 9 μm CCD

All the instruments were designed and built by G.Borisov

The comet discovered on August 30, 2019 with a 0.65-m telescope

Animation of the first pictures



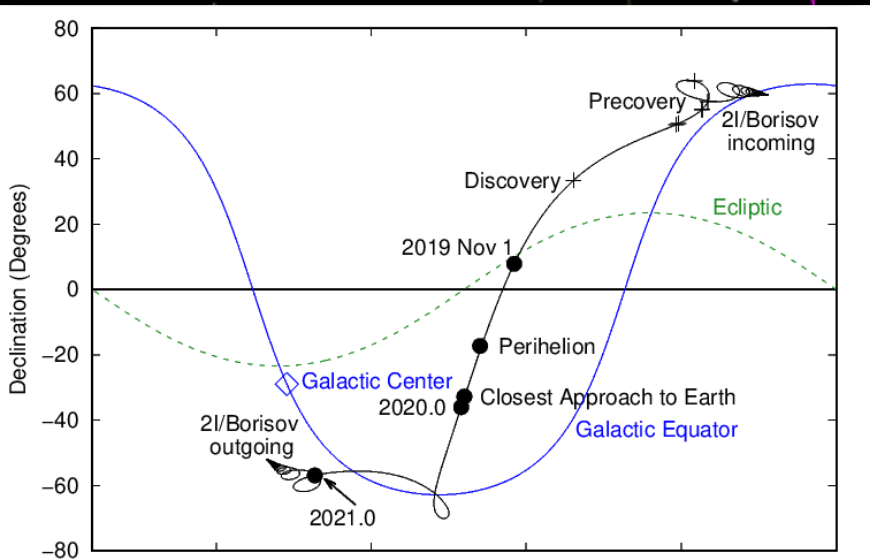
JPL Scout eccentricity ranges		
# of observations	Observation arc (hours)	Eccentricity range
81	225	0.9-1.6
99	272	2.0-4.2
127	289	2.8-4.7
142	298	2.8-4.5
151	302	2.9-4.5

List of first measurements in the Minor planet center catalog:

OC	Date	Observer (s)	Coma	Tail	Exp.
L51	20190830	G. Borisov	7", condensed		
L51	20190901	G. Borisov	7", condensed	15", P.A. 300-320	9 x 120s
H06	20190901	H. Sato	12", condensed		10 x 60s
J95	20190902	P. Birtwhistle	12", diffuse	Poss. elongation in P.A. 300	
N55	20190906	T. Chen et al.	4", mod. cond.	Elongation in P.A. 330/140	
850	20190908	D. T. Durig	23", diffuse	24", P.A. 240-300	150 x 10s
J95	20190908	P. Birtwhistle	14", condensed	Extended in P.A. 295	
121	20190908	I. Slyusarev	10", condensed	50" in P.A. 310	
568	20190908	K. Meech	5", condensed	40" in P.A. 315	

The trajectories of 2I/Borisov and 1I/'Oumuamua

Interstellar velocity inbound (v_{∞})	
Object	Velocity
1I/2017 U1 ('Oumuamua)	26.33 km/s 5.55 au/yr
2I/2019 Q4 (Borisov)	32.2 km/s 6.79 au/yr



Comet imaged by the Keck Telescope

A team of astronomers from Yale University imaged Comet 2I/Borisov on Nov. 24 using the Keck Observatory in Hawaii, revealing the object's tail to be nearly 100,000 miles (160,000 kilometers) long:



Composite image of the comet 2I/Borisov. with a photo of the Earth to show scale.(Image: © Pieter van Dokkum, Cheng-Han Hsieh, Shany Danieli and Gregory Laughlin)

Comet imaged by the Hubble Space Telescope



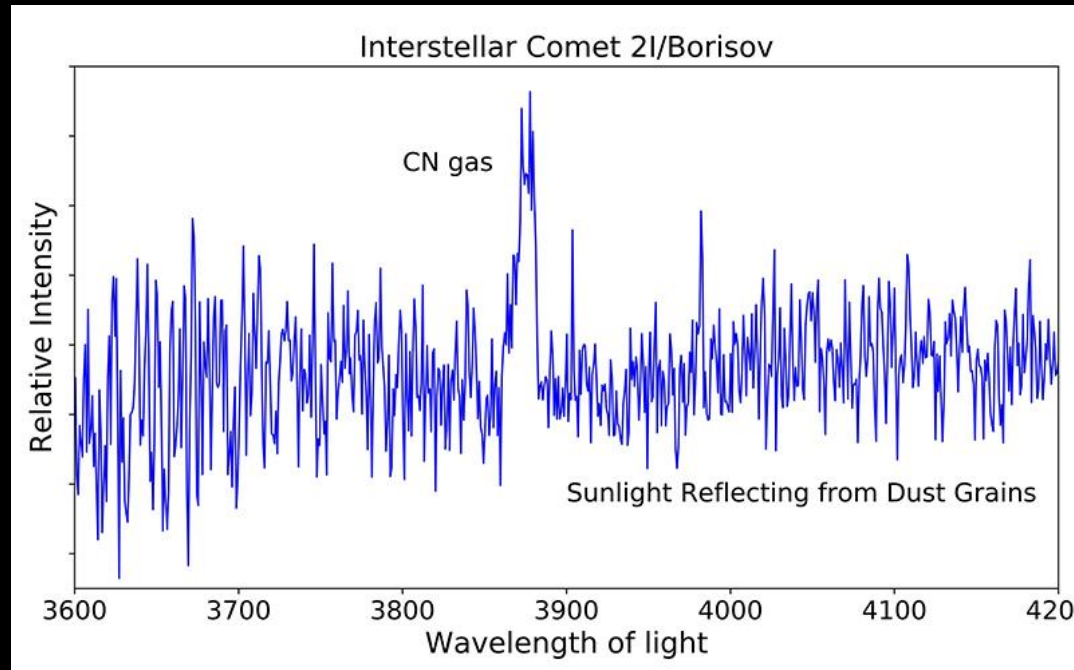


UT 2019-10-12 18:30:05
Hubble Space Telescope
MFC3/UVIS/F359LP
PI: David Jewitt (UCLA)
Animation: Paul Kalas (UC Berkeley)

On Oct 12, 2019 Hubble made
a seven-hour time lapse of the comet.
At that moment, this was the clearest image.

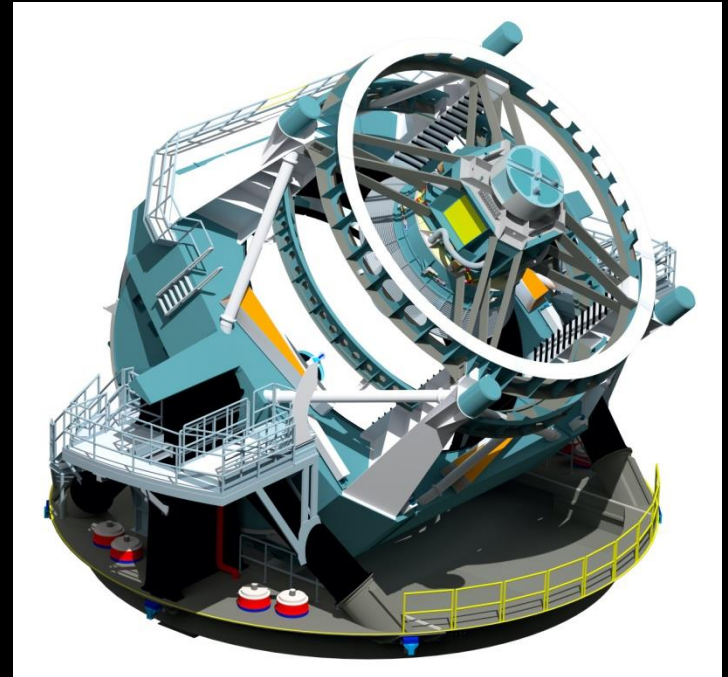
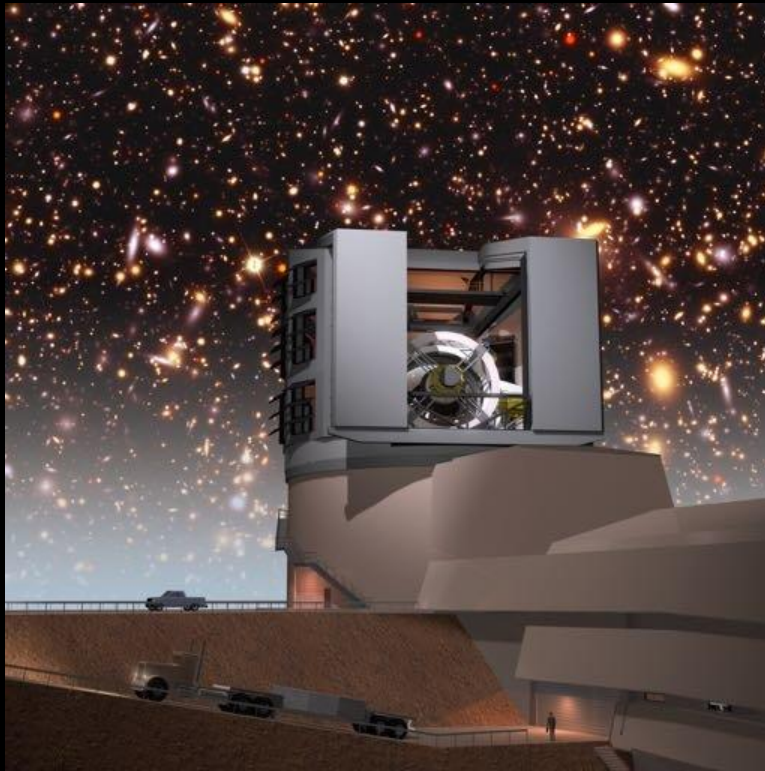
Molecules in the comet 2I/Borisov

An international team including researchers from the STAR Research Institute of ULiège detected CN molecules in the atmosphere of the second interstellar object, 2I/Borisov. This gas, frequently observed in the comets of our Solar System, is now detected for the first time in a body from another system than ours.



The spectrum of interstellar comet 2I/Borisov, shows how the amount of light from the comet depends on the wavelength of the light, or color. The light emitted by the molecules of the CN gas is clearly identified. Credit : Alan Fitzimmons (University of Belfast)

Hundreds of Interstellar objects may visit our Solar System each year!



When the Large Synoptic Survey Telescope becomes fully operational a few years from now, it may detect a few interstellar objects as big as 1I/'Oumuamua and 2I/Borisov every year.

New insights in space science and NEO issue

- Interstellar objects are of great interest for science. They can bring to us direct information on interstellar and intergalactic bodies and conditions.
- The population density of interstellar objects is low in compare to that of NEOs in our Solar System. However these interstellar objects can have huge kinetic energy which makes them objects of special attention.
- We need a worldwide network for detecting dangerous objects. Even amateur tools can be useful in this work.
- IAWN is a good example of the beginning of such an international cooperation.



Acknowledgments:

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astronomical hobby

Thank you for your attention!